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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/552,311	10/07/2005	Johan Oonk	294-229 PCT/US	6644

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EXAMINER	
NGUYEN, NGOC YEN M	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/552,311	OONK ET AL.	
	Examiner	Art Unit	
	Ngoc-Yen M. Nguyen	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 December 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4, 6-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 6-8, 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Caren et al (6,357,223).

Caren '223 discloses a method and an apparatus for the reduction of the amount of pollutants, such as carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NO_x), in the exhaust gas stream produced by the high temperature combustion of fuel. The method and apparatus of the invention are useful with internal combustion engines equipped with at least one catalytic convertor in the exhaust system (note paragraph bridging columns 8-10). The fuel can be gasoline, gasoline-based formulations, diesel fuel, alcohol, natural gas etc. (note column 11, lines 53-56).

Caren '223 discovered that the presence of OH, as well as that of other active or reactive species, such as other free radicals and gaseous molecular intermediates and oxidizers, including O, H, NO_2, H_2O_2, HO_2, and O_3, in the exhaust gases of a combustion engine in the presence of the requisite oxygen, provides a highly effective catalytic conversion of CO and hydrocarbons to non-polluting gas species, i.e., CO_2 and water vapor. The OH and other related free radical and gaseous molecular oxidizers

created by reaction of OH with gaseous species in the exhaust stream act as catalysts independent of or in conjunction with the normal catalytic function of the catalytic converter (note column 10, lines 7-18).

The free radicals or other active species can be produced by a corona discharge device mounted within the catalytic converter (note Figure 13 and column 13, lines 51-53). The corona discharge as disclosed in Caren '223 is considered the same as the claimed "plasma" and since the corona discharge device is mounted within the catalytic converter, the whole "off-gas stream" is being treated in Caren '223.

In a preferred corona discharge device, high voltage power is required, from about 1,000 to 250,000 Hz (= 1-250 kHz) (note column 16, lines 9-12). The end point of "about 1000 Hz" (or about 1 kHz) includes values that are slightly less than 1 kHZ and these values are considered as being well within the claimed range.

The introduction of radicals and related gaseous oxidizing species into the combustion gas stream upstream of downstream end of the catalyst in a catalytic convertor results in the catalysis of the oxidation of CO and HC in the exhaust gas stream, and provides for the rapid removal of those pollutants. The catalytic conversion of CO to CO_2 and hydrocarbon to CO_2 and H_2O by these oxidizing species occurs on the large surface in the catalytic converter, as well as in the gas phase in the exhaust stream. The enhanced conversion of CO and HC to CO_2 and H_2O by radicals and other active species frees the bulk of the precious metal catalytic surface from participating in these competing reactions. The converter's precious metal sites no longer need to play as strong a role in catalyzing the less reactive hydrocarbon species, such as *methane*,

ethane, ethene, benzene and formaldehyde, and, as a result, the catalytic activity at the precious metal sites can be directed toward reduction of nitrogen oxides to nitrogen and other non-polluting gas species (note column 10, lines 30-48). In addition, in internal combustion engines equipped with catalytic convertors, the introduction of radicals and/or active gaseous species also enhances the reduction of NO.sub.x to molecular nitrogen (N.sub.2) (note column 9, lines 46-50). This fairly teaches that the process of Caren '223 is suitable for treating an off-gas containing both methane and NO_x.

The catalytic converter 13 therefore comprises any device that catalytically removes or participants in the removal of at least one pollutant from an exhaust stream generated by burning a fuel, including, but not limited to, those with monolithic or granular ceramic substrates, metallic substrates, or substrates of any kind, and devices with noble metals or any other type of catalytic material. It would also include, without limitation, devices having semiconductor catalysts, such as oxides or sulfides of transition elements, and devices having ceramic-type catalysts, such as alumina, silica-alumina, and zeolites individually, in combination with each other and oxygen storage media such as cerium oxide or in combination with metal catalysts (note paragraph bridging column 11-12).

For the limitation "said off-gas stream is produced by combustion of natural gas in a natural gas engine for combined heat and power generation", it is considered as a product-by-process limitation and the patentability of the claimed process does not depend on the method of generating the off-gas stream, especially when the off-gas

stream, i.e. the product in the product-by-process claim is the same as the gas stream containing the same contaminants as disclosed in Caren '223.

The process of Caren '223 anticipates the claimed process.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 6-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caren '223, optionally further in view of the admitted prior art on page 1.

Caren discloses a process as stated in the above rejection.

For the product-by process limitation, when the examiner has found a substantially similar product as in the applied prior art, the burden of proof is shifted to applicant to establish that their product is patentably distinct and not the examiner to show the same process of making. *In re Brown*, 173 USPQ 685 and *In re Fessmann*, 180 USPQ 324.

Optionally, the admitted prior art on page 1 can be applied to teach that it is known in the art that gas engines such as CHP generate an exhaust gas containing methane and NO_x as contaminants that need to be removed. These contaminants are the same as those in the exhaust gas disclosed in Caren '223, thus, it would have been

obvious to one of ordinary skill in the art to use the process of Caren '223 to purify to exhaust gas generated by the CHP as suggested by the admitted prior art on page 1.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to treat a portion or all of the exhaust gas stream produced by the high temperature combustion of fuel as long as level of the pollutants, such as CO, HC and NO_x of the exhaust stream can be reduced to an acceptable level.
In the event that the disclosed value of "about 1,000" Hz in Caren '223 does not anticipate the instant rage of "below 1 kHz", the value of "about 1,000" Hz in Caren '223 would have suggested to one of ordinary skill in the art a slightly lower value based upon a reasonable expectation of success, In re O'Farrell, 853 F.2d 894, 904, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988).

For claim 4 it would have been obvious to one of ordinary skill in the art to optimize the electric field used to generate the corona discharge in the process of Caren '223 in order to sufficiently produce the desired radicals, active or reactive species.

For claim 9, it would have been obvious to one of ordinary skill in the art to optimize the process temperature in Caren '223 to effectively reduce the amount of pollutants from the exhaust stream. It should be noted that Caren '223 discloses the use of the corona discharge in a catalytic converter, i.e. the exhaust gas is treated with a "plasma" in the presence of a catalyst.

For claims 10-13, Caren '223 discloses that a three-way catalyst is typically used (note column 11, lines 60-62) and the disclosure of the noble metals (note column 12, lines 1-2), fairly teaches Pt, Pd, Rh (note column 3, lines 32-45). Caren '223 does not

specifically disclose the phase of the alumina or the exact combinations for the catalyst, however, it would have been obvious to one of ordinary skill in the art to use any known alumina phase and any known combination for the three-way catalyst used in Caren '223.

For claim 14, Caren '223 discloses that a portion of the cleaned exhaust gas stream 21 that has passed through the catalytic converter 13 is taken from the rear exhaust pipe 22, and diverted to the remote radical generator 23. The output 24 of the remote radical generator 23 is enriched with radicals as a result of the action of a corona discharge on the exhaust gas 21, and is introduced into the exhaust gases in the tailpipe 12 upstream of the downstream end of the catalytic converter 13 (note column 12, lines 50-58). If there is any difference in the order of operation, see Ex parte Rubin , 128 USPQ 440 (Bd. App. 1959) (Prior art reference disclosing a process of making a laminated sheet wherein a base sheet is first coated with a metallic film and thereafter impregnated with a thermosetting material was held to render prima facie obvious claims directed to a process of making a laminated sheet by reversing the order of the prior art process steps.). See also In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) (selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results); In re Gibson, 39 F.2d 975, 5 USPQ 230 (CCPA 1930) (Selection of any order of mixing ingredients is prima facie obvious.)

Applicant's arguments and Declaration filed December 24, 208, 2008 have been fully considered but they are not persuasive.

For the 102 rejection:

Applicants argue that Caren '223 does not disclose a plasma that has a frequency below 1 kHz as now required in Applicants' claims.

As stated in the above rejection, Caren '223 discloses a broad range of "about 1,000 to about 250,000 Hz" (note column 16, lines 11-12) and the end point of "about 1,000" Hz would include values slightly lower than 1,000 Hz (or 1 kHz), which meet the required range of "below 1kHz").

The 103 rejection.

Applicants argue and the Declaration by Mr. Creijghton filed February 20, 2009 states that Caren requires the use of high frequency, high voltage power.

The frequency as disclosed in Caren '223 is still within the claimed range at the lower end value of "about 1,000" Hz (or about 1 kHz). Applicants' claims do not require any voltage power and do not exclude the "high voltage powder" that is used in Caren '223.

The Declaration states that the high frequency, high voltage powder required for the corona discharge device in Caren cannot product plasma capable of reducing the methane content in an off-gas stream of a gas-fired plant of the claimed invention and specifically, the plasma of the claimed invention must be effective for use with off-gas produced by combustion of natural gas in a natural gas engine for combined heat and powder generation.

As stated in the above rejection, the exhaust gas to be treated in Caren '223 are from the combustion of a fuel, such as natural gas (note column 11, lines 53-57), there is no difference seen between an off-gas that was produced by combustion of natural gas in a generic "combustion" process and an off-gas that was produced by combustion of natural gas in a natural gas engine for combined heat and power generation. Again, for the limitation "off-gas *is produced by* combustion of natural gas in a natural gas engine for combined heat an powder generation", it is considered as a product-by-process limitation, note In re Fessmann, In re Brown as stated above. No evidence has been provided by Applicants in the Declaration to support the alleged argument that the corona discharge device in Caren '223 cannot produce plasma capable of reducing the methane content in an off-gas steam of a gas-fired plant.

Applicants argue that the use of low frequencies, i.e., below 1 kHz, according to the claims allow for an effective in situ treatment of a gas stream in a natural gas engine for combined heat and power generation according to the claimed process.

Again, there is no evidence provided by Applicants to support the above argument. The argument is also not commensurate in scope with Applicants' claims because Applicants' claims do not require that the method for treating the off-gas stream is "in-situ". In any event, Caren '223 does teach that the direct, in situ production of free radicals by the action of a corona discharge on water vapor and residual oxygen in the exhaust stream is the most preferred method (note sentence bridging columns 12-13).

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/
Primary Examiner, Art Unit 1793

nmn
April 29, 2009